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FINAL



U.S. Army
Environmental
Center

**No Further Action Decision Under CERCLA
Study Area 16: Shoppette Debris Disposal Area**

**Fort Devens Main Post Site Investigation
Fort Devens, Massachusetts**

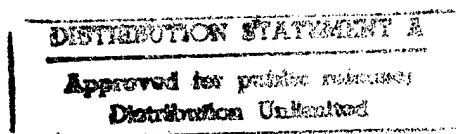
Prepared for:

U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND, MARYLAND 21010

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[DTIC QUALITY INSPECTED 8]



JANUARY 1995

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FINAL

Arthur D Little

**No Further Action Decision
Under CERCLA**

**Study Area 16: Shoppette
Debris Disposal Area**

**Fort Devens
Main Post Site
Investigation,
Fort Devens,
Massachusetts**

Submitted to

**U.S. Army Environmental
Center (USAEC)
Aberdeen Proving
Ground, Maryland**

**Revision 1
January 1995**

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Acorn Park
Cambridge, Massachusetts
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List of Acronyms and Abbreviations

ABB	ABB Environmental Services, Inc.
BAF	Bioaccumulation Factor
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
DDD	1,1-dichloro-2, 2-bis(p-chlorophenyl) ethane
DDE	Dichlorophenyl-dichloro-ethylene
DDT	Dichlorodiphenyl trichloroethene
DEH	Directorate of Engineering and Housing
DOD	Department of Defense
EPA	United States Environmental Protection Agency
IRDMIS	Installation Restoration Data Management Information System
IRP	Installation Restoration Program
kg	Kilogram
MCP	Massachusetts Contingence Plan
MADEP	Massachusetts Department of Environmental Protection
MEP	Master Environmental Plan
mg	Milligrams
mg/kg	Milligrams Per Kilogram (parts per million)
MSL	Mean Sea Level
NFA	No Further Action
NPL	National Priorities List
PA	Preliminary Assessment
PCB	Polychlorinated Biphenyl
PCL	Protective Contaminant Level
PRE	Preliminary Risk Evaluation
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
SA	Study Area
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
TPHC	Total Petroleum Hydrocarbons
TRC	Technical Review Committee
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Center
VOC	Volatile Organic Compound

Executive Summary

Investigations of Study Area 16 (Shoppette Debris Disposal Area) at Fort Devens, Massachusetts, have resulted in the decision that no further studies or remediation are required at this site. Study Area 16 was identified in the Federal Facilities Agreement between the U. S. Environmental Protection Agency and the U.S. Department of Defense as a potential site of contamination.

Fort Devens was placed on the National Priorities List under the Comprehensive Environmental Response, Compensation and Liability Act as amended by the Superfund Amendments and Reauthorization Act on December, 21, 1989. In addition, under Public Law 101-510, the Defense Base Realignment and Closure Act of 1990, Fort Devens was selected for cessation of operations and closure. In accordance with these acts and to support the overall mission of environmental restoration and base closure, numerous studies have been conducted that address Study Areas at Fort Devens, including a Master Environmental Plan, an Enhanced Preliminary Assessment, and Site Investigation Reports.

The Shoppette Debris Disposal Area (SA-16) is located east of Marne Street and south of Patton Road. The disposal area is bounded on the east by an intermittent stream, the Fort Devens installation boundary, and the Boston & Maine Railroad tracks. The study area encompasses approximately 1 acre along the northern edge of an inactive gravel pit.

SA-16 was identified as Landfill No. 12 in the 1992 *Master Environmental Plan*. The MEP reports that waste was disposed at the site for approximately three weeks in 1985 to reduce the volume of refuse put into the sanitary landfill (SA-5). However, the MEP notes that no surface evidence of a landfill was observed during a site visit in 1988. The 1992 *Enhanced Preliminary Assessment* also notes that no evidence of a disposal area was found at the SA-16 location.

The Site Investigation of Study Area 16 was completed in 1993 in conjunction with 12 other study areas as part of the Main Post Site Investigation.

No evidence of buried refuse or debris was observed during the investigation. Some surficial debris was noted and investigated, but did not correspond with buried materials. Because the investigation focused on the area reportedly used for disposal, it appears that either no subsurface disposal and no significant surface disposal occurred at the site or the disposal material was removed. However, there is no documentation of a removal. The detection of metals and trace concentrations of TPHC, SVOCs, and pesticides does not appear to indicate a source of contamination. Based on the results of the preliminary risk evaluation, the detected concentrations of these analytes are not likely to pose an unacceptable risk to human health or the environment.

Executive Summary

1 On the basis of findings at SA-16, there is no evidence or reason to conclude that the
2 historical use of SA-16 as a debris disposal area has caused significant environmental
3 contamination or poses a threat to human health or the environment. The decision has
4 been made to remove SA-16 from further consideration in the Installation Restoration
5 Program (IRP) process.
6
7

1.0 Introduction

This decision document has been prepared to support a No Further Action decision at Study Area (SA) 16 - Shoppette Debris Disposal Area at Fort Devens, Massachusetts. The report was prepared as part of the U.S. Department of Defense (DOD) Base Realignment and Closure (BRAC) program to assess the nature and extent of contamination associated with site operations at Fort Devens. Under Public Law 101-510, the Defense Base Realignment and Closure Act of 1990, Fort Devens has been selected for cessation of operations and closure. An important aspect of BRAC actions is to determine environmental restoration requirements before property transfer can be considered. Studies at SA-16 were conducted to support this overall mission.

In conjunction with the Army's Installation Restoration Program (IRP), Fort Devens and the U.S. Army Environmental Center (USAEC; formerly the U.S. Army Toxic and Hazardous Materials Agency) initiated a Master Environmental Plan (MEP) in 1988. The MEP consists of assessments of the environmental status of SAs, specifies necessary investigations, and provides recommendations for response actions with the objective of identifying priorities for environmental restoration at Fort Devens. SA-16 was identified as a potential source of contamination in the MEP (Argonne National Laboratory, 1992). On December 21, 1989, Fort Devens was placed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA).

An Enhanced Preliminary Assessment (PA) (Weston, 1992a) was also performed at Fort Devens to address areas not normally included in the CERCLA process, but requiring review prior to closure. A final version of the PA report (Weston, 1992b) was completed in April 1992. In 1993, DOD, through USAEC, also initiated a Site Investigation (SI) of SA-16 along with twelve other SAs as part of the Main Post Site Investigation at Fort Devens. The SI Report (Arthur D. Little, Inc., 1993a) recommended No Further Action at SA-16.

2.0 Background and Physical Setting

2.1 Fort Devens Description and Land Use

Fort Devens is located in Middlesex and Worcester Counties, Massachusetts, approximately 35 miles west of Boston, Massachusetts. Fort Devens is located in portions of four towns - Ayer, Harvard, Lancaster, and Shirley. Fort Devens currently covers approximately 9,280 acres, consisting of the Main Post, North Post, and South Post areas. Massachusetts Highway Route 2 crosses Fort Devens and separates the Main Post from the South Post (Figure 2-1).

The majority of the facilities at Fort Devens lie within the Main Post, located north of Massachusetts Highway Route 2. The Main Post provides all of the on-post housing, including over 1,700 family units and 9,800 bachelor units (barracks and unaccompanied officers' quarters). Other facilities on the Main Post include community services (e.g., the shoppette, cafeteria, post exchange, bowling alley, golf course, and hospital), administrative buildings, classroom and training facilities, maintenance facilities, and ammunition storage.

The South Post is located south of Route 2 and contains training areas, ranges, and a drop zone. The North Post abuts the Main Post to the north of West Main Street in Ayer. The principal activities on the North Post are the Waste Water Treatment Plant and the Moore Army Airfield.

The terrain surrounding Fort Devens includes rolling areas and wooded hills. Fort Devens is located in the Nashua River Basin, and approximately 8 miles of the river, running from south to north, lie within the reservation boundaries (Figure 2-1). Several lakes and ponds are located within Fort Devens. Land surface elevations within Fort Devens range from about 200 feet above mean sea level (MSL) along the Nashua River on the northern boundary to 450 feet above MSL in the southern portion of the installation.

The surrounding towns (Ayer, Harvard, Shirley, and Lancaster) are zoned for residential, commercial, and limited industrial development. All have fewer than 10,000 residents, except Harvard, which has an estimated 13,000.

2.2 Regional Geology

The surficial geology throughout most of Fort Devens is characterized by glacially derived unconsolidated sediments. A mantle of Pleistocene-age glacial till, outwash, and lacustrine (lake) deposits, ranging in thickness from a few inches to approximately 100 feet, blanket the irregular bedrock surface underlying Fort Devens. The glacial lake deposits consist chiefly of sand and gravelly sand. Post-glacial deposits consist mostly of river-terrace sands and gravels; fine alluvial sands and silts beneath modern floodplains; and muck, peat, silt, and sand in swampy areas.

2.0 Background and Physical Setting

The surficial deposits are underlain by a complex assemblage of intensely folded and faulted metasedimentary rocks with occasional igneous intrusions. Bedrock occurs at depths of approximately 100 feet to ground surface where it outcrops at Shepley's Hill. Bedrock is typically unweathered to only slightly weathered at Fort Devens, as is typical in glacial terrain.

2.3 Regional Hydrogeology

Fort Devens lies within the Nashua River drainage basin. The Nashua River flows south to north through the installation, and is the eventual discharge locus for all surface water and ground water flow at the installation. The water of the Nashua River has been assigned to Class B under Commonwealth of Massachusetts regulations. Class B surface water is "designated for the uses of protection and propagation of fish, other aquatic life and wildlife, and for primary and secondary contact recreation" (314 CMR 4.03). The Nashua River and its major tributaries are shown on Figure 2-1.

Glacial outwash deposits constitute the primary aquifer at Fort Devens. Ground water also occurs in the underlying bedrock; however, flow is limited because the rocks have no primary porosity and water moves only in fractures and dissolution voids. Ground water in the surficial aquifer at Fort Devens has been assigned to Class I under Commonwealth of Massachusetts regulations. Class I consists of ground waters that are "found in the saturated zone of unconsolidated deposits or consolidated rock and bedrock and are designated as a source of potable water supply" (314 CMR 6.03). Ground water provides the main source of potable water for Fort Devens. Ground water is pumped from three large-diameter and 74 small-diameter production wells.

2.4 Study Area Description and History

2.4.1 Study Area Description and Land Use

The Shoppette Debris Disposal Area (SA-16) is located east of Marne Street and south of Patton Road. The disposal area is bounded on the east by an intermittent stream, the Fort Devens installation boundary, and the Boston & Maine Railroad tracks. The study area encompasses approximately 1 acre along the northern edge of an inactive gravel pit (Figure 2-2).

SA-16 is currently an unused, open area. No evidence of buried refuse or debris was observed during the investigation. The parcel has been designated for future use as Open Space according to the *Devens Reuse Plan* (Massachusetts Land Bank, 1993).

2.0 Background and Physical Setting

2.4.2 Related Investigations and Site History

SA-16 was identified as Landfill No. 12 in the *Master Environmental Plan* (Argonne National Laboratory, 1992). The MEP reports that waste was disposed at the site for approximately three weeks in 1985 to reduce the volume of refuse put into the sanitary landfill (SA-5). The refuse was reportedly disposed at the site under the supervision of DEH until dumping was halted because of the close proximity to a wetland and Cold Spring Brook. Construction debris and an unknown amount of two inch metal chain were disposed at the site. However, the MEP notes that no surface evidence of a landfill was observed during a site visit in 1988.

The *Enhanced Preliminary Assessment* (Weston, 1992a, 1992b) also notes that no evidence of a disposal area was found at the SA-16 location. However, the Enhanced PA states that review of aerial photographs showed a cleared area with refuse in 1952, excavation in 1965, and evidence of scattered material and liquid in 1972 and in 1980. No significant change is noted in the aerial photos in 1991. Based on the review completed as part of the Main Post SI, it appears that the cleared area, refuse, and liquid described in the Enhanced PA correspond to the gravel pit south of SA-16 rather than SA-16 itself.

Reviews of the files and interviews with Fort Devens personnel during the Main Post SI indicate that the gravel pit formerly extended north to Patton Road, but was backfilled along the northern edge with construction debris, redefining the northern edge of the gravel pit to its current position (approximately 75 feet south of Patton Road). This backfill activity was reported to have occurred during the realignment of Patton Road and only involved the disposal of construction and wood debris.

Historical aerial photographs (EPIC, 1991) of Fort Devens were examined as part of the Main Post SI to document land uses and condition through time and to confirm the observations reported in the MEP and Enhanced PA. The aerial photograph review indicated that as of 1943, a cleared path or road extended from Patton Road through the current SA-16 to the gravel pit area to the south. By 1952, the majority of the current SA-16 had been cleared. Some possible refuse was identified near the center of an excavated area to the south of SA-16 in the 1952 photo. This excavated area is also evident in the 1965 photo and an unidentified dark area was observed along the western edge of the gravel pit. By 1972 the excavation area appears to be inactive with water present in the excavation and revegetation beginning to occur around the edges. The water and dark area identified within the excavation from 1972 to the present appear to correspond to standing water with associated wetland vegetation. No evidence of disposal activities or excavation along the northern edge of the gravel pit at the current location of SA-16 were identified during this aerial photograph review.

2.4.3 Geology of Study Area SA-16

Study Area SA-16 has a ground surface elevation of approximately 260 feet above MSL. Bedrock has been mapped at an elevation of 175 feet above MSL in the *Ground Water Flow Model at Fort Devens, Massachusetts* (Engineering Technology

2.0 Background and Physical Setting

1 Associates, 1992). Subsurface material observed in test pits excavated as part of the
2 Main Post SI consisted of poorly sorted fine to coarse sands with gravel and cobbles.
3 No buried refuse was observed in the test pits.
4

2.4.4 Hydrogeology of Study Area SA-16

5 According to the ground water model, the ground water level in the glacial outwash
6 (overburden) aquifer in the area of SA-16 is approximately 242 feet above MSL,
7 which would result in ground water at an approximate depth of 18 feet. According to
8 the model, ground water flow in both the overburden and bedrock aquifers in the area
9 of SA-16 is to the north, toward Cold Spring Brook. Ground water was not
10 encountered in the test pits, which were excavated to a depth of 16 feet. A stream
11 channel, running south to north, is located to the east of SA-16 along the installation
12 boundary; however, no water was observed in the channel during the investigation.
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3.0 Site Investigation

3.1 Site Investigation Report

The investigation of SA-16 was done in conformance with the *Final Supplemental Work Plan - Main Post Site Investigation (SI) - Fort Devens, MA* (Revision 1) (Arthur D. Little, 1993b).

The scope of work for this area included:

- Records review, interviews, review of aerial photographs, and visual inspections
- A geophysical survey (magnetometer and electromagnetic terrain conductivity surveys) at 10-foot intervals along lines spaced 10 feet apart to identify any anomalous readings that may represent buried debris
- Excavation of four test pits with one sample collected from each pit for laboratory analysis
- Collection and analysis of one sample composited from the four test pits for RCRA hazardous waste characterization

The Final SI report (Arthur D. Little, 1993a) presents documentation of methods and activities performed during the Main Post SI and discusses the results of the SI, including conclusions and recommendations for each study area. The SI Report recommends No Further Action for SA-16.

3.2 Preliminary Risk Evaluation

The criteria and guidelines used for screening risks in the preliminary risk evaluation (PRE) are described below. A complete summary of criteria and guideline values used in the Main Post SI PREs is presented in the Final SI Report (Arthur D. Little, 1993a). Uncertainties associated with the risk evaluation methodologies are also discussed in the Final SI Report.

3.2.1 Human Health Risk Evaluation Methodology

3.2.1.1 Soil Risk Evaluation Methodology

EPA Region III Risk-Based Concentration Table (Second Quarter, 1993). EPA Region III has developed risk-based soil concentrations based on published reference doses and cancer potency slopes and "standard" exposure scenarios. The concentrations reported correspond to a hazard quotient of 1, indicating no risk of noncarcinogenic effects, or a lifetime cancer risk of one in 1 million, whichever is lower. Both residential and commercial/industrial health-protective soil guidelines are published by EPA Region III.

3.0 Site Investigation

1 *Massachusetts Contingency Plan (MCP), July 1, 1993.* Categories of health-protective
2 soil guidelines were established by the Massachusetts Department of Environmental
3 Protection (MADEP, 1993) for use in the characterization of risk posed by disposal
4 sites. For assumed future residential use, study area concentrations are compared to
5 the Method 1 GW-1/S-1 category. The S-1 category indicates that the soil is
6 accessible and that both child and adult frequency or intensity of use may be high.
7 The GW-1 category additionally assumes the potential use of the ground water as a
8 drinking water source. For assumed future commercial/industrial use, study area soil
9 concentrations are compared to the GW-1/S-2 category. The S-2 category indicates
10 high adult use of the area, and minimal use of the area by children. For chemicals
11 with no soil guidelines, we have used reportable concentrations published in the MCP
12 guidelines. It should be noted that although Method 1 standards are used for
13 screening purposes in the PRE, Method 1 is strictly applicable to a disposal site if
14 there is a standard for each oil and hazardous material of concern, and if the oil or
15 hazardous material is present in and will foreseeably migrate only within ground
16 water and soil.

3.2.2 Ecological Risk Evaluation

3.2.2.1 Soil Risk Evaluation Methodology

19 *Surface Soil Ecological Protective Contaminant Levels.* The ecological criteria or
20 guidelines used for comparison to detected concentrations in soils were derived from
21 the ABB Chronic Exposure Food Web Model (ABB, 1992). No state or federal
22 standards or guidelines exist to evaluate potential effects due to the ingestion of food
23 and surface soil by terrestrial organisms. In the 1992 SI Report for Groups 2 and 7
24 (ABB, 1992), ABB developed a food web model which derives protective
25 contaminant levels (PCLs). The PCLs estimate the potential dietary exposure for
26 several potential receptor species at Fort Devens, using published bioaccumulation
27 factors (BAFs), dietary profiles, and ingestion rates for the indicator species. These
28 PCLs are assumed to protect the most sensitive of the modeled indicator species
29 (i.e., short-tailed shrew) from direct toxic effects and/or bioaccumulation-mediated
30 toxic effects.
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4.0 Contamination Assessment

4.1 Geophysical Survey

A combination magnetic and terrain conductivity survey was performed throughout an approximately 2-acre portion of SA-16 (Figure 2-2) to evaluate the potential presence and extent of buried debris. The results of the magnetic and electromagnetic geophysical surveys did not indicate the presence of an anomalous area coincident with the reported historical debris disposal practices. Three small anomalies were detected by both geophysical techniques but were subsequently determined by ground checks to correspond with surface metal (i.e., fence posts, steel cable, and a wheel rim). The location of the geophysical grid is shown on Figure 2-2.

4.2 Test Pit Soil Sampling Evaluation

Four test pits were excavated at the study area, distributed within the area reportedly used for disposal. Three of the test pits were also located at geophysical anomalies to confirm that additional metallic debris was not present beneath the detected geophysical anomalies and one test pit was centrally located to evaluate the potential for disturbed or backfilled materials. Additionally, one shallow trench was excavated through each of two surficial piles of soil fill material to determine if materials other than soil were present in these piles. No unnatural debris or refuse was encountered in any of the test pits or trenches. The stratigraphic horizons identified in the test pits, which were excavated to a maximum depth of 16 feet, appeared to be undisturbed. No ground water was encountered. The locations of the test pits and trenches are shown on Figure 2-2.

One soil sample was collected from each of the four test pits for analysis.

No VOCs were detected in the samples (Table 4-1). Trace concentrations of SVOCs were detected in two of the four test pits: phenanthrene and fluoranthene were detected in 16E-93-01X, and fluoranthene was detected in 16E-93-04X. Trace concentrations of TPHC and the pesticides DDD and DDT were detected in one of the four test pits (16E-93-01X). These concentrations are at the low end of the Fort Devens pesticide background range. Metals were detected above background concentrations at all four test pits.

The results of the waste characterization analyses indicate no exceedance of the regulatory levels. The results of the waste characterization analyses are summarized in the Main Post SI Report (Arthur D. Little, 1993a).

5.0 Preliminary Risk Evaluation

5.1 Risk Evaluation of Soils at Study Area SA-16

Inorganic Compounds. Every inorganic analyte was detected above background in at least one of the four samples, except for cobalt (no background concentration available), lead, and sodium. However, most of the detected concentrations of inorganic analytes are within one order of magnitude of the background concentration for that analyte.

Arsenic, beryllium, cobalt, and manganese were detected only slightly above or within one order of magnitude of the lowest human health criteria, the EPA Region III residential screening concentrations for soil. Arsenic was detected at 26.7 and 24.4 mg/kg (residential noncarcinogenic criterion of 23 mg/kg), beryllium at 0.582 and 0.722 (residential criterion of 0.28) cobalt at 10.3 mg/kg (criterion of 10 mg/kg), manganese at 412 and 421 mg/kg (residential criterion of 390 mg/kg). However, the residential soil criteria are most likely overly conservative for the future use scenarios anticipated for SA-16 (described in Section 4.3.3.1). For arsenic, the EPA Region III guidance value is only slightly above the Fort Devens background concentrations (23 mg/kg versus 21 mg/kg background). In conclusion, contaminant concentrations in soils are not expected to pose a significant public health risk at SA-16.

Ecological soil PCLs were exceeded for several inorganic analytes (aluminum, barium, lead, and vanadium). However, for every analyte, these PCLs are lower than site-specific background so that the observed concentrations do not add incrementally to the baseline risk for ecological receptors at Fort Devens.

Organic Compounds. VOCs were not detected. TPHC, SVOCs, organochlorine pesticides, and PCBs were not detected at concentrations above any applicable human health or ecological criteria.

5.2 Summary

Soil samples at SA-16 were collected as composite samples of soils excavated from test pits and were not surface soil samples. Analysis of samples composited over vertical depths may not reflect the true level of contaminants occurring in surface soils, for which exposure is most likely and for which the risk-based criteria are developed, however, there was no indication of surficial contamination. Furthermore, residential criteria were chosen as the basis for a future use scenario, even though this is an overly conservative and unlikely scenario for this study area. Based on the lack of contamination indicated by the analytical data and visual observations, it can be concluded that there is no significant public health or ecological risk posed by the soils at SA-16.

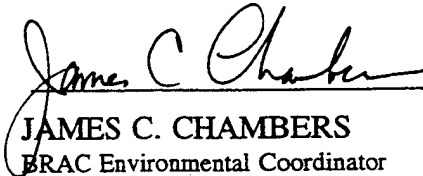
6.0 Conclusions

No further action is recommended at SA-16. This recommendation is based on the historical information regarding the use of the site, visual observations, and the results of sampling and analysis. This recommendation is also based in part on the results of a preliminary risk evaluation.

No evidence of buried refuse or debris was observed during the investigation. Some surficial debris was noted and investigated, but did not correspond with buried materials. Because the investigation focused on the area reportedly used for disposal it appears that either no subsurface disposal and no significant surface disposal occurred at this site, or the disposed material was removed. However, there is no documentation of a removal. The detection of metals and trace concentrations of TPHC, SVOCs, and pesticides does not appear to indicate a source of contamination. Based on the results of the preliminary risk evaluation, the detected concentrations of these analytes are not likely to pose an unacceptable risk to human health or the environment.

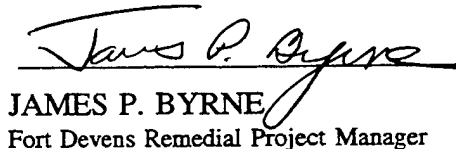
1 7.0 Decision

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6 On the basis of findings at SA-16, there is no evidence or reason to conclude that the
7 historical use of SA-16 as a debris disposal area has caused significant environmental
8 contamination or poses a threat to human health or the environment. The decision has
9 been made to remove SA-16 from further consideration in the Installation Restoration
10 Program (IRP) process. In accordance with CERCLA 120(h)(3), all remedial actions
11 necessary have taken place, and the USEPA and MADEP signatures constitute
12 concurrence in accordance with the same.
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16 JAMES C. CHAMBERS
17 BRAC Environmental Coordinator
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18 JAN 95
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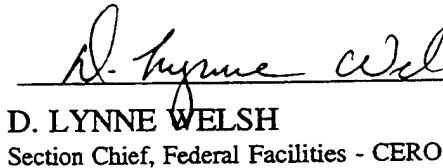
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22 U.S. ENVIRONMENTAL PROTECTION AGENCY
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24 
25 JAMES P. BYRNE
26 Fort Devens Remedial Project Manager
27

1/18/95
Date

28 ☒ Concur
29 [] Non-concur (please provide reasons for non-concurrence in writing)
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33 MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

34 
35 D. LYNNE WELSH
36 Section Chief, Federal Facilities - CERO
37
38

1/18/95
Date

39 ☒ Concur
40 [] Non-concur (please provide reasons for non-concurrence in writing)
41

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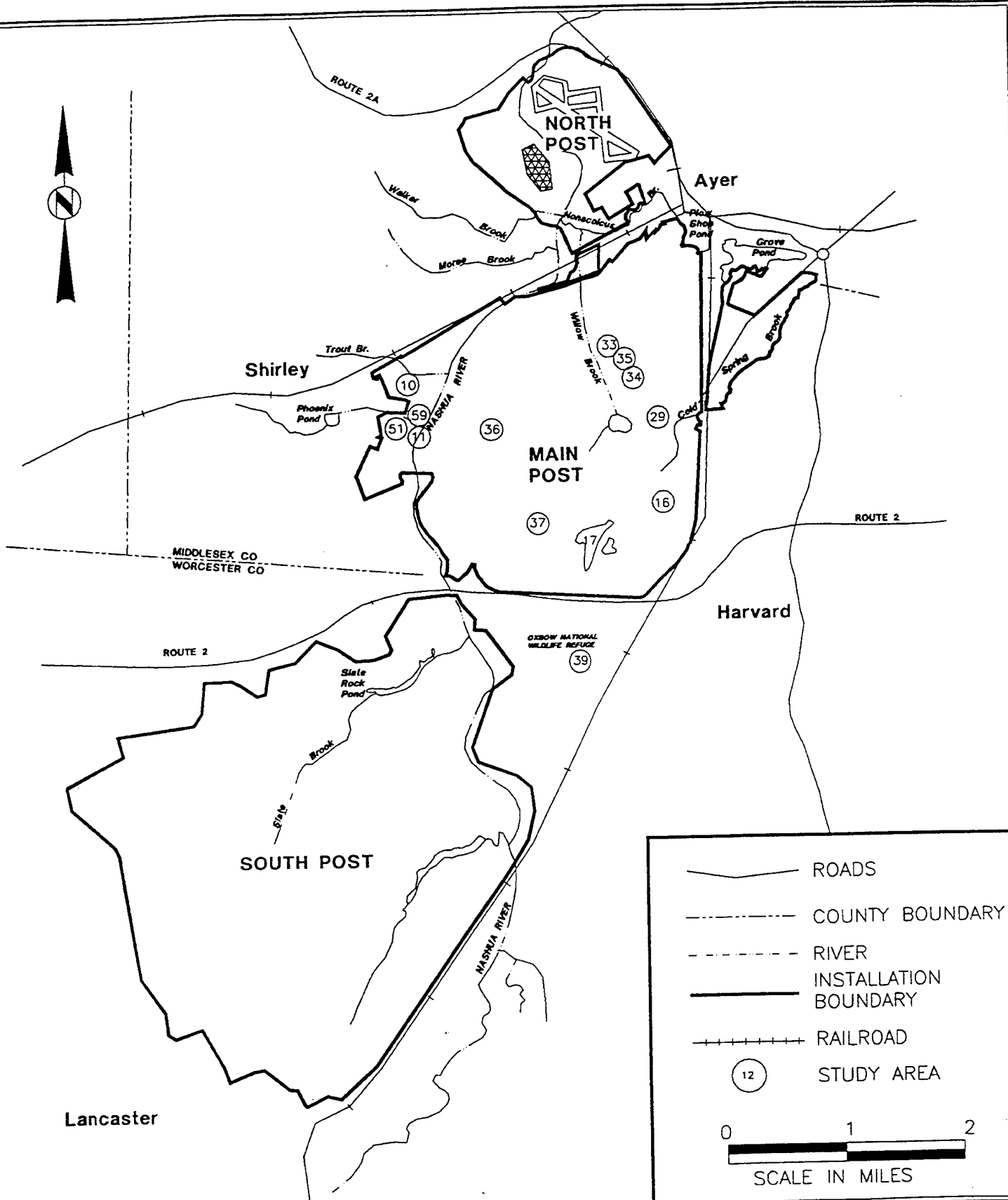
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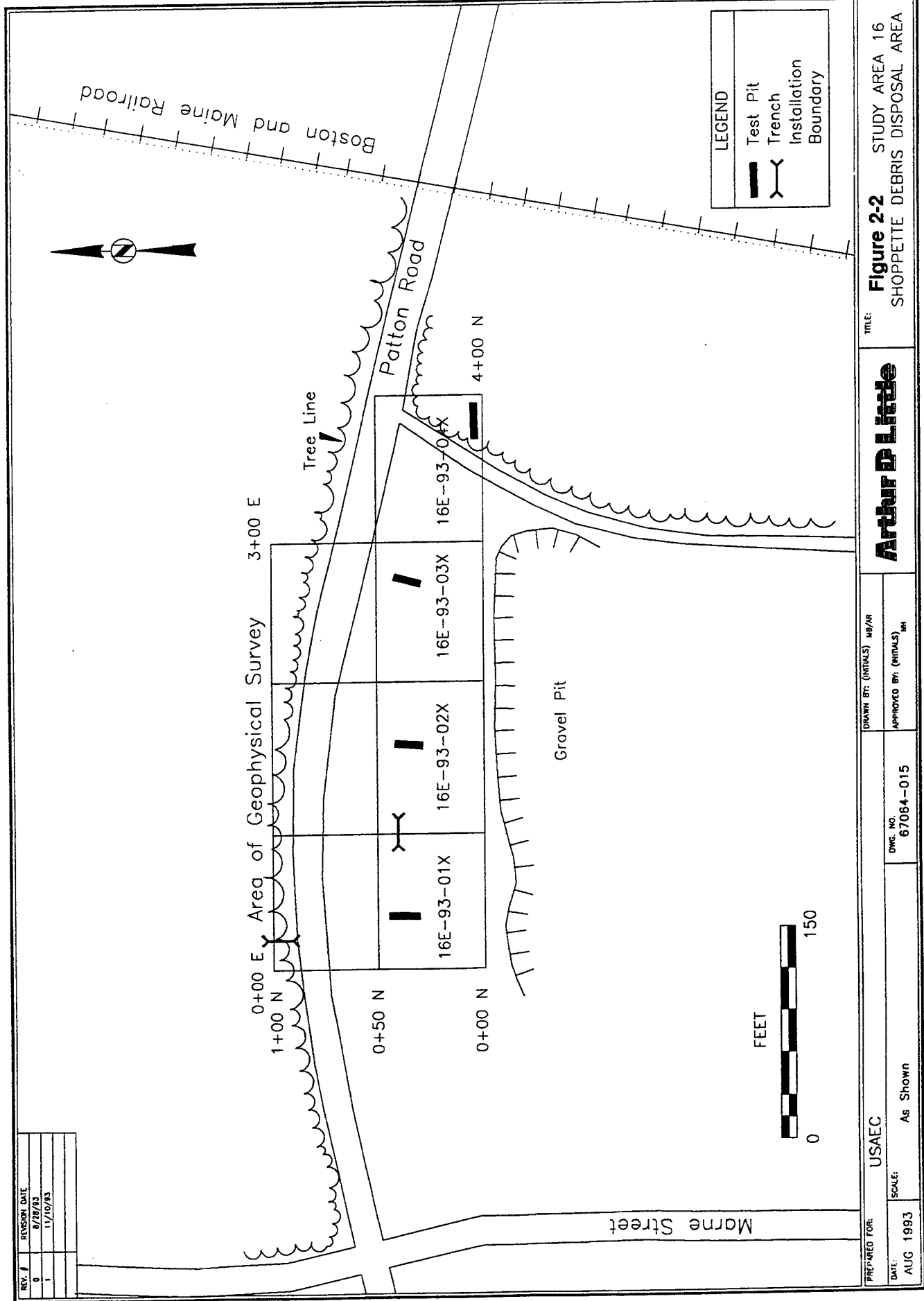
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PREPARED FOR:			Figure 2-1 LOCATION OF STUDY AREAS WITHIN FORT DEVENS
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Arthur D Little



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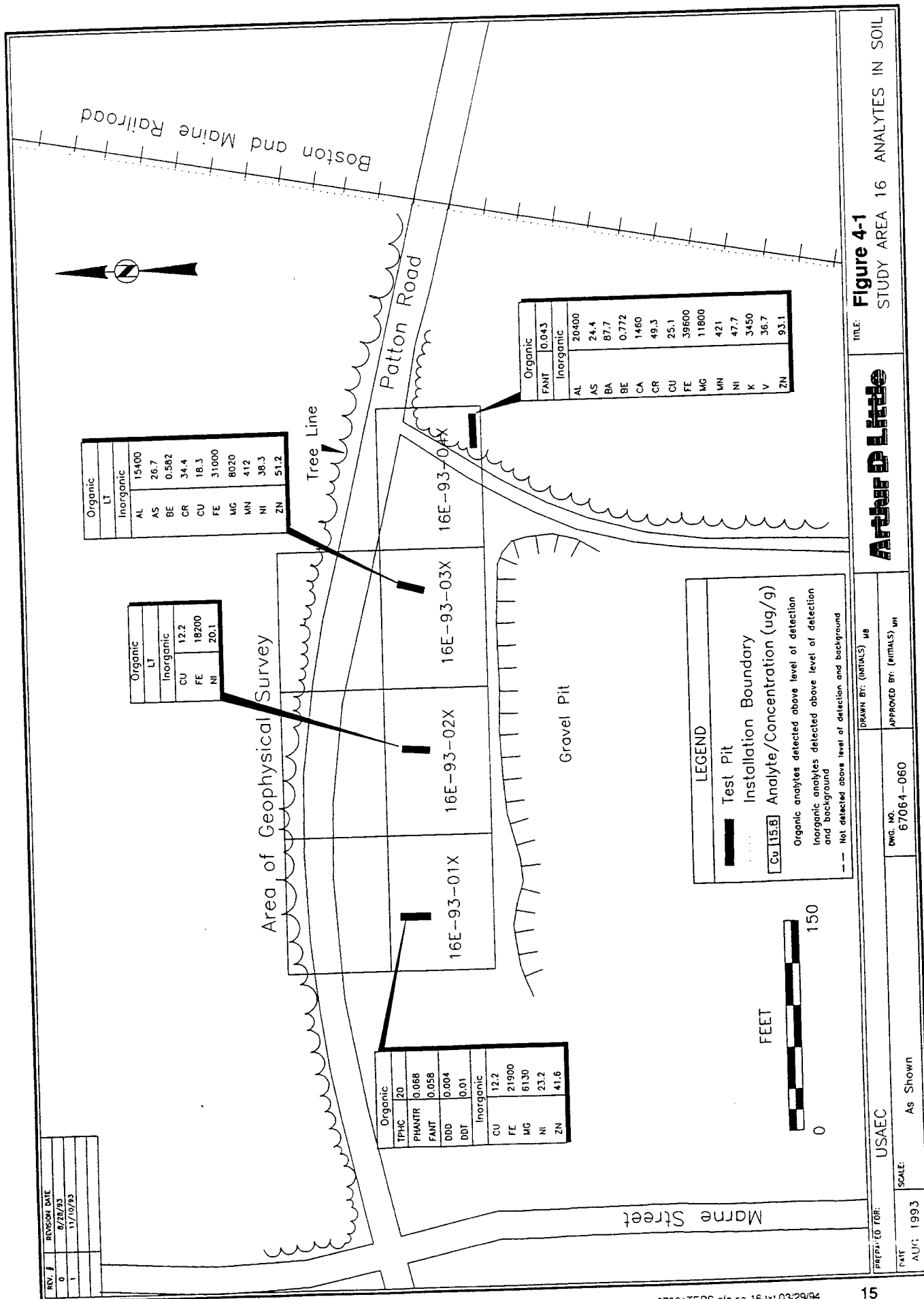


Figure 4-1
STUDY AREA 16 ANALYTES IN SOIL

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DRAWN BY: (INITIALS) MB

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DWG. NO. 67064-060

USAEC

SCALE: As Shown

DATE

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Table 4-1
Fort Devens Main Post Site Investigation
Study Area 16 - Analytes in Soils

Site ID Field Sample ID Sample Depth (ft)	FL Devens Soil Background	Residential Criteria	Ecological Surface Soil Criteria	16E-93-01X AFXTP01X 0 - 16	16E-93-02X AFXTP02X 0 - 16	16E-93-03X AFXTP03X 0 - 16	16E-93-04X AFXTP04X 0 - 16
Volatile Organic Compounds (ug/g) not detected	-	500	-	20	10 LT	10 LT	10 LT
Total Petroleum Hydrocarbons (ug/g)	-	500	-	-	-	-	-
Semi-volatile Organic Compounds (ug/g) <i>Polynuclear Aromatics</i>	-	700	510	0.088	0.032 LT	0.032 LT	0.032 LT
Phenanthrene	-	600	1100	0.058	0.032 LT	0.032 LT	0.043
Fluoranthene	-	-	-	-	-	-	-
Organochlorine Pesticides and PCBs (ug/g)	-	2	1.07	0.004	0.003 LT	0.003 LT	0.003 LT
p,p'-DDD	-	2	1.07	0.01	0.004 LT	0.004 LT	0.004 LT
p,p'-DDT	-	-	-	-	-	-	-
Metals (ug/g)	15000	230000	1700	10500	6220	15400	20400
Aluminum	21	23	33	15	15.4	26.7	24.4
Arsenic	42.5	5500	41	22.5	12.9	36.3	87.7
Barium	0.347	0.28	0.88	0.427 LT	0.427 LT	0.582	0.722
Beryllium	1400	-	-	907	495	1010	1460
Calcium	31	390	180	24.3	13.1	34.4	49.3
Chromium	-	10	50	6.15	6.51	9.98	10.3
Cobalt	8.39	2900	34	12.2	12.2	18.3	25.1
Copper	15000	-	-	21800	18200	31000	39600
Iron	48.4	300	4	18.4	9.51	13.9	9.83
Lead	6600	-	-	6130	3120	8020	11800
Magnesium	300	390	1500	236	290	412	421
Manganese	14	300	100	23.2	20.1	38.3	47.7
Nickel	1700	-	-	1310	432	1430	3450
Potassium	131	-	-	38.7 LT	38.7 LT	69.3	76.9
Sodium	28.7	550	10	16.2	9.29	25	36.7
Vanadium	35.5	2500	640	41.6	32.7	51.2	93.1
Zinc	-	-	-	-	-	-	-

Notes:

LT = Less than detection limit

ND = Not detected

B = Above Fort Devens soil background

H=Above human health guideline

E=Above ecological guideline

11/1/93